IS 12526 (1988): bucket for shaft sinking operations in mines [MED 8: Mining Techniques and Equipment]

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UDC 622·67·063·7 : 622·251

Indian Standard

(Reaffirmed 1999)

SPECIFICATION FOR BUCKET FOR SHAFT SINKING OPERATIONS IN MINES

Mine Transportation Sectional Committee, EDC 91; Shaft Equipment Subcommittee, EDC 91 : 1 (EDC 50 : 7) [Ref : Doc : EDC 91/50 (4243)]

1. Scope — Lays down the requirements for buckets (also known as kibbles) used for hoisting of men and material in shaft sinking operations in mining industry.

2. Nomenclature — Shall be as specified in Table 1 read with Fig. 1.

3. Shapes — The buckets shall be manufactured in two shapes of base; Shape A with concave base or Shape B with flat base (*see* Fig. 1).

4. Quantity of Components — Quantity, in number, of components required is given in col 3 of Table 1.

5. Dimensions

5.1 *Main Dimensions* — Shall be as given in Fig. 1 read with Table 2.

5.2 *Dimensions of Components* — Shall be as given in tables and figures referred to in col 4 of Table 1.

5.2.1 For buckets up to and including 1·50 m³ (1 500 litres) capacity, a recess of 10 × 10 cm size shall be cut in the body at the height of $\frac{h_3}{2}$ from the bottom and located at right angle to the suspension bar. Suitable shaped steel box made of same material as that of bucket and plate size having general dimensions of 10 × 10 × 12 cm shall be welded from inside the recess. For buckets above 1·50 m³ (1 500 litres) capacity, recesses similar to that mentioned above shall be provided at $\frac{h_3}{3}$ and $\frac{2h_3}{3}$ distances from the bottom of the bucket. These recesses shall be stagggered horizontally by 30 cm.

6. Material — Materials recommended for various components are given in columns 5 and 6 of Table 1; where not given, suitable materials shall be used.

6.1 Base ring (for Shape B) and the rim may be manufactured from the material conforming to IS : 1079-1973 'Specification for hot rolled carbon steel sheet and strip (*third revision*)'.

6.2 Base reinforcement (for Shape B) may be manufactured from the material conforming to IS : 808 (Part 5)-1976 'Dimensions for hot rolled steel sections: Part 5 Equal leg angles (*second revision*)'.

6.3 Counter sinking of holes, where required, shall conform to IS : 3406 (Part 1)-1986 'Dimensions for countersinks and counterbores : Part 1 Countersinks (*second revision*)'.

7. General Requirements

7.1 The suspension bar shall be hammer forged from one piece and shall be forged out to at least one third of the blank cross section. The shapping shall follow the grains. The suspension bar shall be normalized after which no shapping shall be done. No welding shall be done in the manufacture of suspension bar.

7.2 The external and internal clamp plates shall be either forged or made from rolled steel. In case of rolled steel, the longitudinal direction shall correspond with the grain texture of the material. The clamp plates shall be normalized and the scale layer shall be removed. The plates shall not have any cracks or internal separation.

7.3 The rivet holes in the assembling of buckets shall be drilled in one setting.

7.4 Rivets used shall conform to either IS : 1928-1961 or IS : 1929-1982 'Secification for hot forged steel rivets for hot closing (12 to 36 mm diameter) (*first revision*)' as indicated in Table 10.

Adopted 12 December 1988

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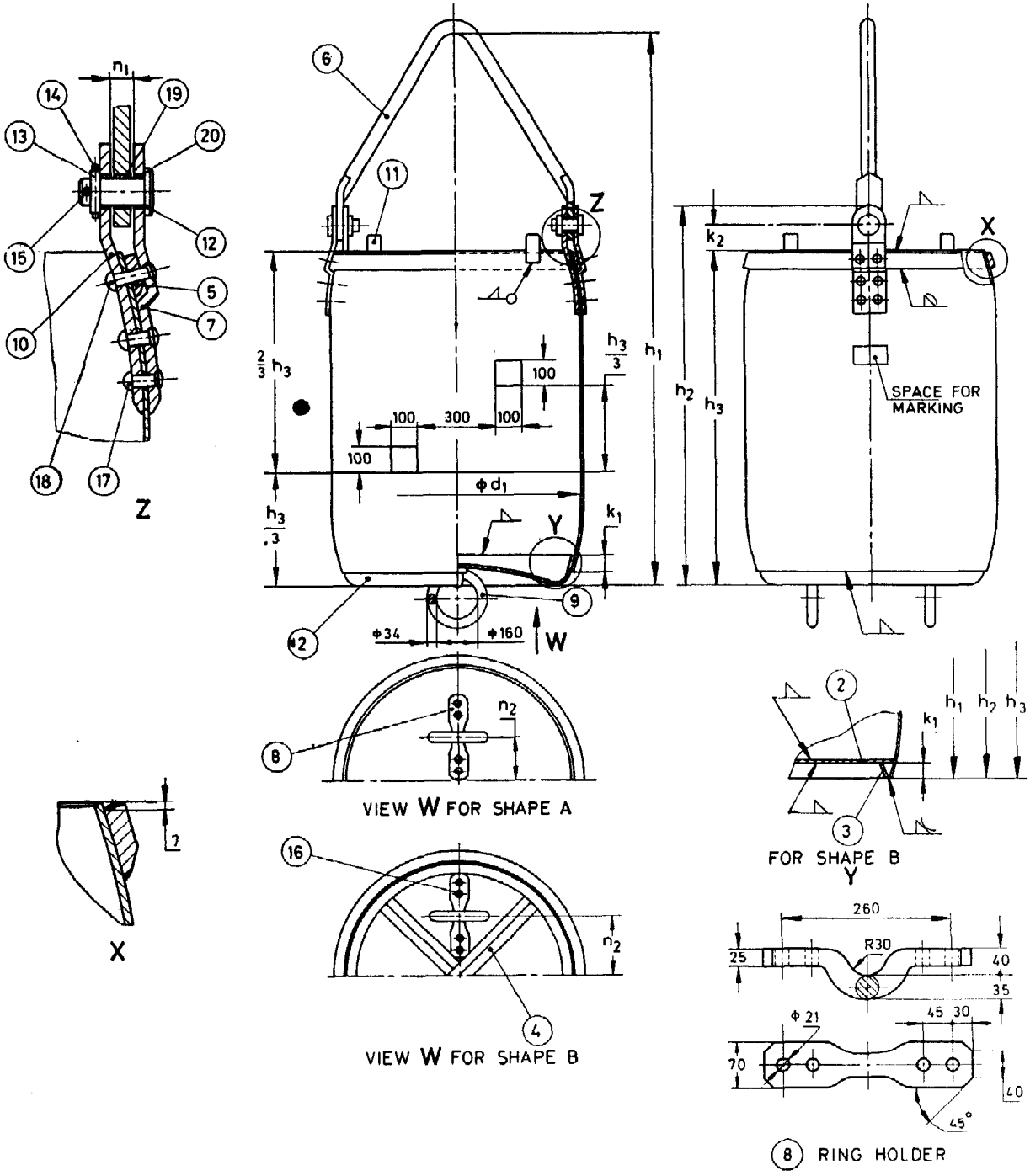
7.5 Bolts shall be either forged or made of rolled steel. The longitudinal direction of bolts shall follow the grain pattern. The bolts shall be normalized. The bolts shall not have any cracks or inner separation.

7.6 Spring dowel sleeves used shall conform to IS : 5988-1970.

7.7 Split pins used shall conform to IS : 549-1974.

7.8 In assembled buckets, suspension bucket shall rotate freely on its axles.

7.9 *Design Requirements* — The suspension bar and all other parts/components connecting the suspension bar to the body of the bucket shall be designed and manufactured with a minimum factor of safety of 13 and factor of 4 with respect to yield strength.



All dimensions in millimetres.

FIG. 1 BUCKET FOR SHAFT SINKING

TABLE 1 NOMENCLATURE, DIMENSIONS AND MATERIALS FOR COMPONENTS OF BUCKETS

(*Clauses* 2, 4, 5.2, 6, 8.2 and *Fig.* 1)

Number in Fig. 1	Nomenclature	Quantity (Number of Pieces per Bucket)	Reference for Dimensions	Material	
				Grade	Indian Standard
1	2	3	4	5	6
1.	Body	1	Table 3	Grade 1 or 2B	IS : 2002-1982 'Specification for steel plates for pressure vessels for intermediate and high temperature service including boilers (*first revision*)'
2.	Base (Shape A or Shape B)	1	Table 4	Any grade	IS : 226-1975 'Specification for structural steel (standard quality) (*fifth revision*)' Grade A of IS : 2062-1984 'Specification for weldable structural steel (*third revision*)'
3.	Base ring	1	Table 5	—	—
4.	Base reinforcement	1	Table 6	—	—
5.	Rim	1	Table 7	—	—
6.	Suspension bar	1	Table 8	11 Mn 2 20 Mn 2 Any steel	IS : 1570-1961 'Schedules for wrought steels for general engineering purposes', or IS : 4432-1967 'Specification for case hardening steels', or IS : 1875-1978 'Specification for carbon steel billets, blooms, slabs and bars for forgings (*fourth revision*)'
7.	External clamp	2	Table 9	Any steel	IS : 2002-1982 or IS : 1875-1978
8.	Ring holders	2	Fig. 1 **Note** — In case of base of Shape A, the shape of ring holders shall follow the shape of the base	Grade 2A or 2B	IS : 2002-1982
9.	Rings	2	Fig. 1	High tensile steel	—
10.	Internal clamp plates	2	Table 10	Any steel	IS : 2002-1982 or IS : 1875-1978
11.	Stop piece	4	Table 11 **Note** — Stop pieces shall be through welded on all sides	Grade 1	IS : 2002-1982

(*Continued*)

TABLE 1 NOMENCLATURE, DIMENSIONS AND MATERIALS FOR COMPONENTS OF BUCKETS — *Contd*

Number in Fig. 1	Nomenclature	Quantity (Number of Pieces per Bucket)	Reference for Dimensions	Material	
				Grade	Indian Standard
1	2	3	4	5	6
12.	Bolts	2	Table 12	C45 or C60	IS : 1570-1961
13.	Fitting ring	2	Table 13	Mild steel	—
14.	Spring dowel sleeve	2	Table 12	—	—
15.	Split pin	2	Table 12	—	—
16.	Rivets (Snap head)	8	Table 10	—	—
17.	Rivets (Snap head)	8*/12†	—	—	—
18.	Rivets (Snap head)	4	Table 10	—	—
19.	Bush	2	Table 8	C45 and C60 or 55 Si7	IS : 1570-1961
20.	Bush	4	Tables 9 and 10	—	—

*For buckets of nominal size 0·50 to 1·00 m^3 (500 to 1 000 litres).

†For buckets of nominal size over 1·00 m^3 (1 000 litres) (*say*, 1 250 to 4 000 litres).

8. Tests

8.1 All tests shall be carried out at the manufacturer's works and/or in approved testing laboratory. The results of the tests shall be recorded in a certificate of test which shall be retained by the user during the service life of the bucket or its components.

8.2 *Dimensional Checks* — Suspension bars and other components including bolts, etc, constituting the suspension assembly shall be checked for dimensional accuracies according to relevant figures and tables referred to in col 4 of Table 1.

8.3 *Proof Load Test* — The suspension bar and bolts shall be subjected to a proof load of three times of safe working load for five minutes. There shall not be any permanent deformation in the components after the test.

8.4 *Non-destructive Testing* — After proof load, the suspension bar and all other parts/components connecting the suspension bar to the body of the bucket shall be subjected to tests in accordance with IS : 7743-1975 'Recommended practice for magnetic particle testing and inspection of steel forgings' and IS : 8791-1978 'Code of practice for ultrasonic flaw detection of ferritic steel forgings' to ensure that these are free from harmful defects.

8.5 All welds shall be inspected in accordance with IS : 822-1970 'Code of procedure for inspection of welds'.

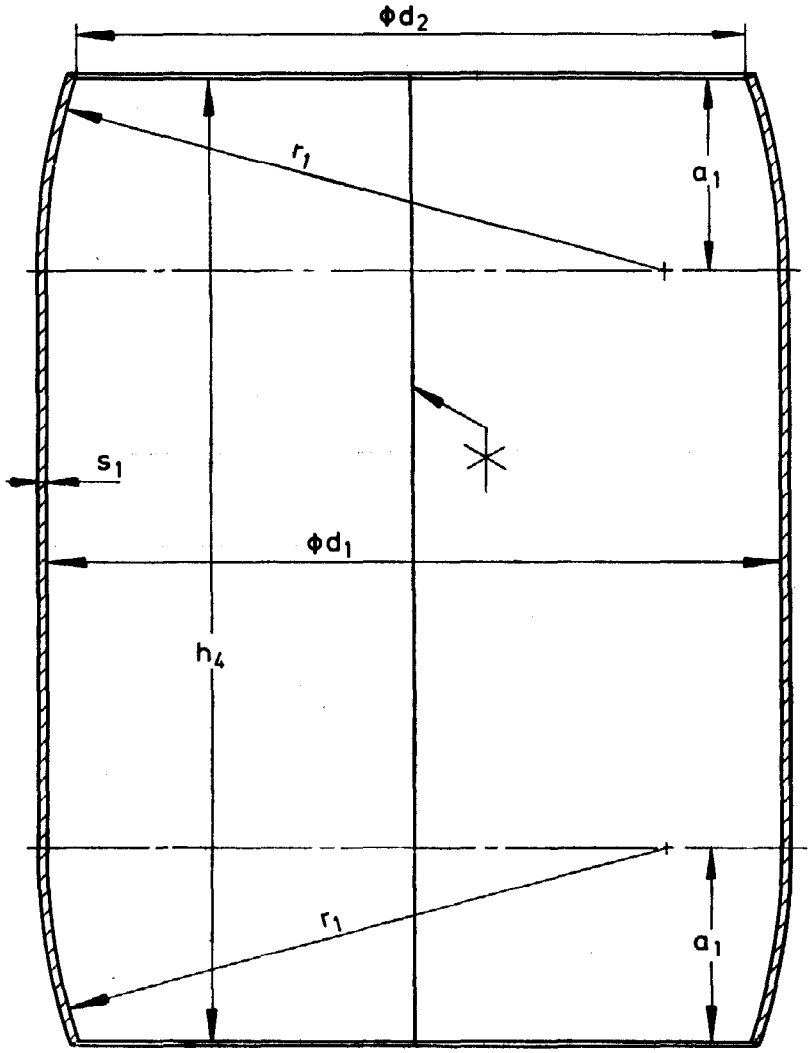
TABLE 2 MAIN DIMENSIONS FOR BUCKETS FOR SHAFT SINKING

(*Clause* 5.1 and *Fig.* 1)

All dimensions in millimetres.

Nominal Capacity of Bucket		Inside Diameter	h_1		h_2		h_3		k_1	k_2	n_1	n_2		Mass	No. of Persons Allowed	Mass of Loaded Bucket	Pay Load
		d_1	Shape A	Shape B	Shape A	Shape B	Shape A	Shape B				Shape A	Shape B	kg		kg	kg
m^3	l																
0·50	500	800	—	1 915	—	1 370	—	1 200	—	95	28	—	175	320	2	820	500
0·75	750	900	2 140	2 019	1 470	1 420	1 300	1 250	—		33	165	225	400	3	1 250	850
1·00	1 000	1 050	2 325	2 275	1 570	1 520	1 400	1 350	60			200	250	510	4	1 650	1 140
1·25	1 250	1 150	2 410	2 340	1 655	1 585	1 470	1 400		105	38		275	680	5	2 050	1 370
1·50	1 500		2 660	2 590	1 905	1 835	1 720	1 650					300	740		2 500	1 760
1·50	1 500	1 250	2 540	2 470	1 705	1 635	1 520	1 450				250			6		
1·75	1 750		2 760	2 690	1 925	1 855	1 720	1 650						860		2 900	2 040
2·00	2 000	1 350	2 765	2 695					80	115	43	270	325	1 000	7	3 300	2 300
2·25	2 250	1 450	2 785	2 715	1 875	1 805	1 670	1 600				330		1 120	8	3 700	2 580
2·50	2 500		2 885	2 815	1 975	1 905	1 770	1 700						1 170		4 150	2 980
3·00	3 000	1 550	—	3 035	—	2 015	—	1 800		120		—	350	1 510	9	4 950	3 440
3·50	3 500	1 650	—	3 200	—	2 065	—	1 850			48	—	400	1 780	10	5 800	4 020
4·00	4 000	1 750	—	3 250	—	2 115	—	1 900				—		2 040	12	6 600	4 560

TABLE 3 DIMENSIONS OF BODY
(*Clause* 5.2 and *Table* 1)
All dimensions in millimetres.

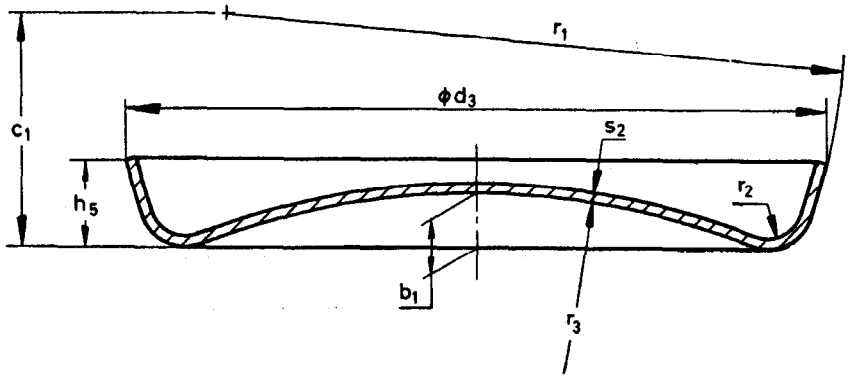


Nominal Capacity of Bucket		Inside Diameter d_1	a_1	d_3	h_4	r_1	s_1
m^3	l						
0·50	500	800	250	720	1 200	800	8
0·75	750	950		870	1 250		
1·00	1 000	1 050		970	1 350		10
1·25	1 250	1 150	300	1 047	1 400	900	
1·50	1 500				1 650		
1·50	1 500	1 250		1 147	1 450		
1·75	1 750				1 650		
2·00	2 000	1 350		1 247			
2·25	2 250	1 450		1 347	1 600		
2·50	2 500				1 700		
3·00	3 000	1 550		1 447	1 800		12
3·50	3 500	1 650		1 547	1 850		
4·00	4 000	1 750		1 647	1 900		

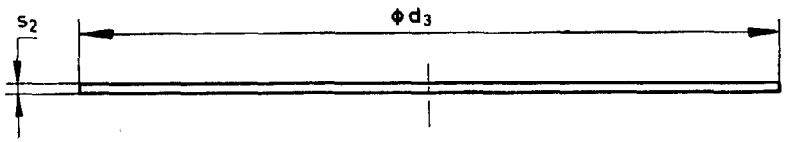
TABLE 4 DIMENSIONS FOR BASE

(*Clause* 5.2 and *Table* 1)

All dimensions in millimetres.



For Shape A buckets of 0·75 m³ to 2·50 m³ (750 to 2 500 litres) nominal capacity



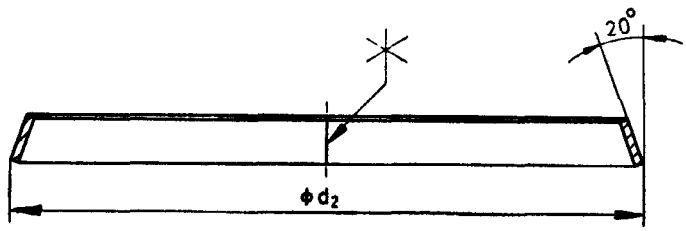
For Shape B buckets of 0·50 m³ to 4·00 m³ (500 to 4 000 litres) nominal capacity

Nominal Capacity		Outside Diameter	b_1	c_1	h_5	r_1	r_2	r_3	s_2
m^3	l	d_3							
0·50	500	754	—	—	—	—	—	—	—
0·75	750	804	75	300	110	800	45	1 000	12
1·00	1 000	1 004	90						
1·25	1 250	1 085	80	370	130	900	60	1 300	16
1·50	1 500								
1·50	1 500	1 185	100				65		
1·75	1 750								
2·00	2 000	1 295			150		95	1 400	20
2·25	2 250	1 395	120						
2·50	2 500								
3·00	3 000	1 495	—	—	—	—	—	—	
3·50	3 500	1 595	—	—	—	—	—	—	
4·00	4 000	1 695	—	—	—	—	—	—	

TABLE 5 DIMENSIONS FOR BASE RING (FOR SHAPE B ONLY)

(*Clause* 5.2 and *Table* 1)

All dimensions in millimetres.

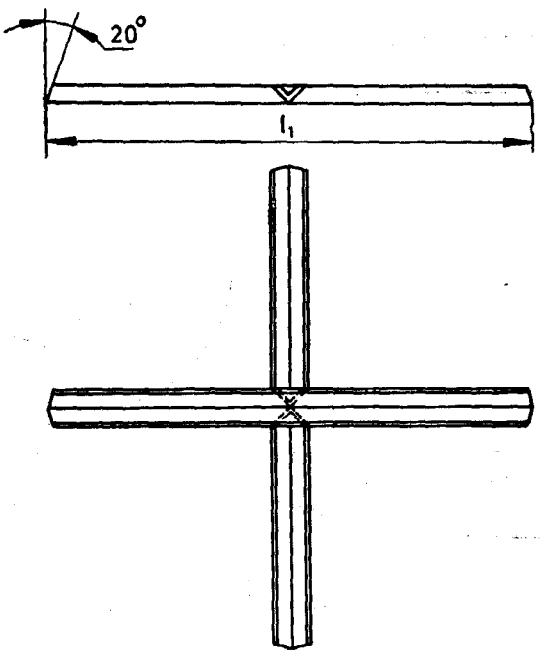


Nominal Capacity of Bucket		Outside Diameter d_2	Steel Strip According to IS : 1079-1973
m^3	l		
0·50	500	720	60×8
0·75	750	870	
1·00	1 000	970	60×10
1·25	1 250	1 047	
1·50	1 500		
1·50	1 500	1 147	
1·75	1 750		
2·00	2 000	1 247	80×10
2·25	2 250	1 347	
2·50	2 500		
3·00	3 000	1 447	80×12
3·50	3 500	1 547	
4·00	4 000	1 647	

TABLE 6 DIMENSIONS FOR BASE REINFORCEMENT (FOR SHAPE B ONLY)

(*Clause* 5.2 and *Table* 1)

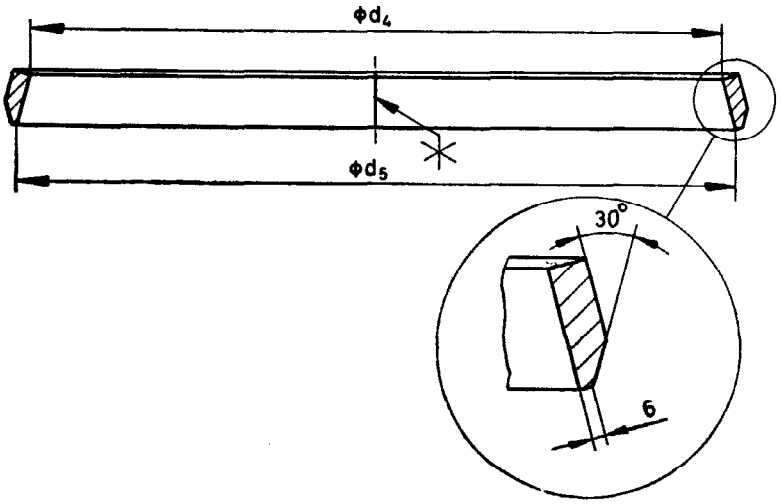
All dimensions in millimetres.



Nominal Capacity of Bucket		Length l_1	Angles According to IS : 808 (Part 5)-1976
m^3	l		
1·75	1 750	1 125	50×5
2·00	2 000	1 225	60×8
2·25	2 250	1 325	
2·50	2 500		
3·00	3 000	1 420	
3·50	3 500	1 520	
4·00	4 000	1 620	

TABLE 7 DIMENSIONS FOR RIM
(*Clause* 5.2 and *Table* 1)

All dimensions in millimetres.

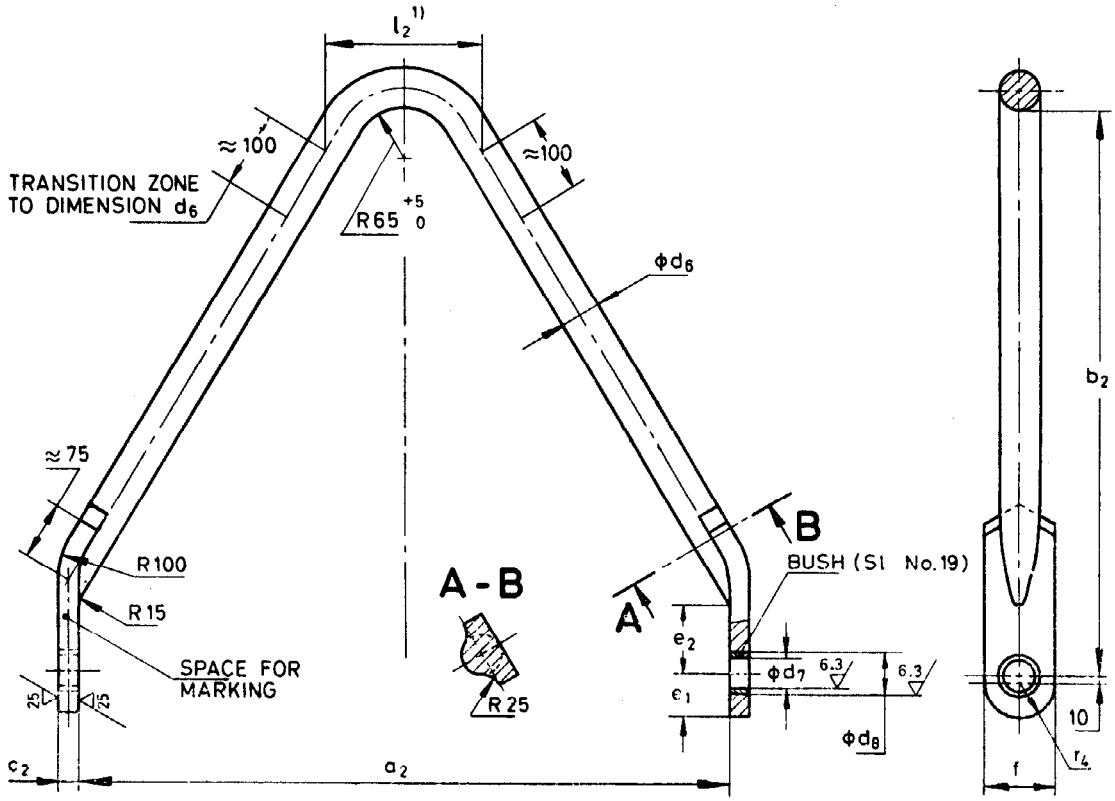


Nominal Capacity of Bucket		Inside Diameter d_1	d	Steel Strip According to IS : 1079-1973
m^3	l			
0·50	500	740	774	60×16
0·75	750	893	927	65×20
1·00	1 000	995	1 030	
1·25	1 250	1 072	1 115	75×20
1·50	1 500			
1·50	1 500	1 172	1 215	
1·75	1 750			
2·00	2 000	1 273	1 322	90×20
2·25	2 250	1 373	1 422	
2·50	2 500			
3·00	3 000	1 479	1 529	
3·50	3 500	1 579	1 629	
4·00	4 000	1 679	1 729	

TABLE 8 DIMENSIONS FOR SUSPENSION BAR WITH BUILT IN BUSHES

(*Clause* 5.2 and *Table* 1)

All dimensions in millimetres.



Nominal Capacity of Bucket		Internal Width										
		a_2 +5 0	b_2 ±10	c_2 +2 0	d_6	d_7 +0·5 0	d_8*	e_1 +5 0	e_2 +5 0	f +5 0	l_2† +20 0	r_4
m^3	l											
0·50	500	715	620	20	45+3 0	40	50	55	90	90	490	45
0·75	750	860	745	25	51+3 0						205	
1·00	1 000	965	830		57+3 0						205	
1·25	1 250	1 035	835	30	62+3 0	50	60	60	95	100	205	50
1·50	1 500		835		65+3 0						205	
1·50	1 500	1 135	915								205	
1·75	1 750		925		70+4 0	60	70	70	105	120	205	60
2·00	2 000	1 230	930	35	73+4 0						210	
2·25	2 250	1 330	1 000		76+4 0						210	
2·50	2 500		1 000		80+4 0						215	
3·00	3 000	1 430	1 115	40	85+5 0	70	80	80	110	140	230	70
3·50	3 500	1 530	1 230		90+5 0						230	
4·00	4 000	1 630	1 230		95+5 0						260	

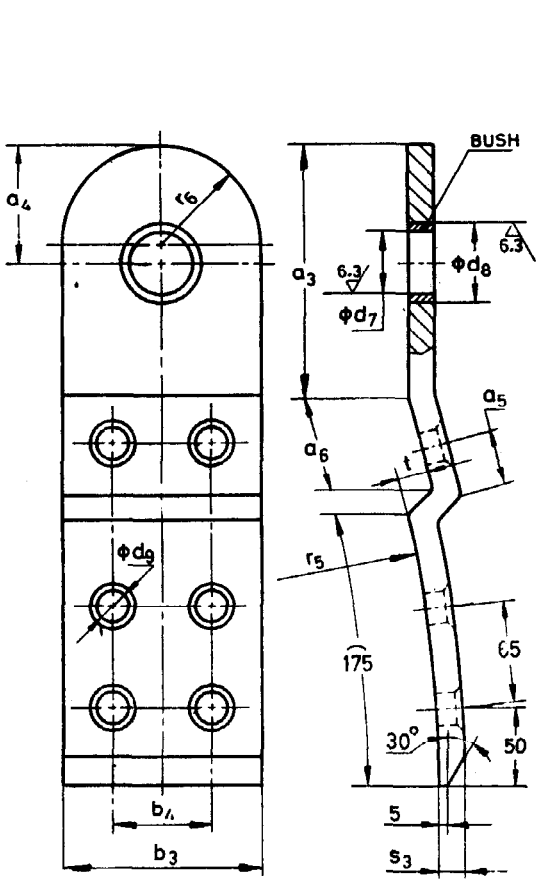
*d_8 *Max* — d_8+10 mm.

†In area l_2, the diameter d_6 shall be 5 to 10 percent than that specified in table to cater to wear.

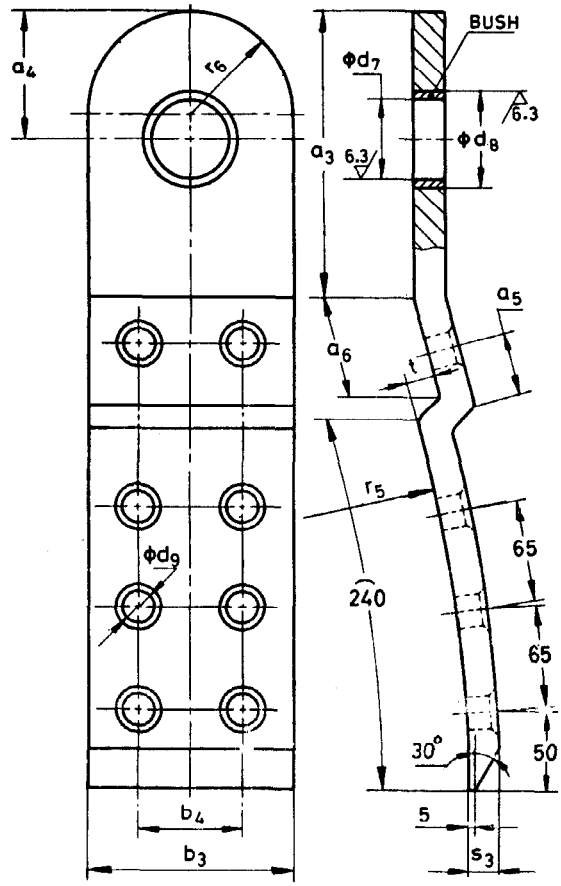
TABLE 9 DIMENSIONS FOR EXTERNAL CLAMP PLATES WITH BUSHES

(*Clause* 5.2 and *Table* 1)

All dimensions in millimetres.



For buckets of 0·50m³ to 1·00 m³
(500 to 1 000 litres) capacity



For buckets of 1·25 m³ to 4·00 m³
(1 250 to 4 000 litres) capacity

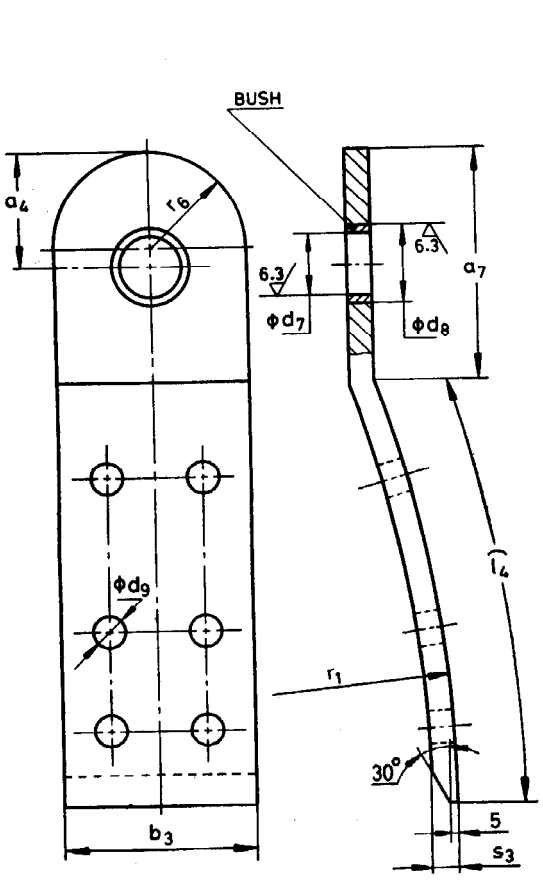
Nominal Capacity of Bucket		Width												
m^3	l	b_3 mm	a_3	a_4	a_5	a_6	b_4	d_7 +0·5 0	d_8* 86	d_9	r_5	r_6	s_3 mm	t
0·50	500	120	160	75	35	60	62	40	50	21	808	62·5	16	17
0·75	750													
1·00	1 000										810			
1·25	1 250	130	180	80	40	65	65	50	60		910	65	20	19
1·50	1 500													
1·50	1 500													
1·75	1 750	150	200	90	50	70	75	60	70	25		75		21
2·00	2 000													
2·25	2 250													
2·50	2 500													
3·00	3 000	160	220	95			80	70	80		912	80	25	
3·50	3 500													
4·00	4 000													

*d_8 *Max* = d_8 + 10 mm — ID of hole in clamp plate and OD of bush to match with interference fit.

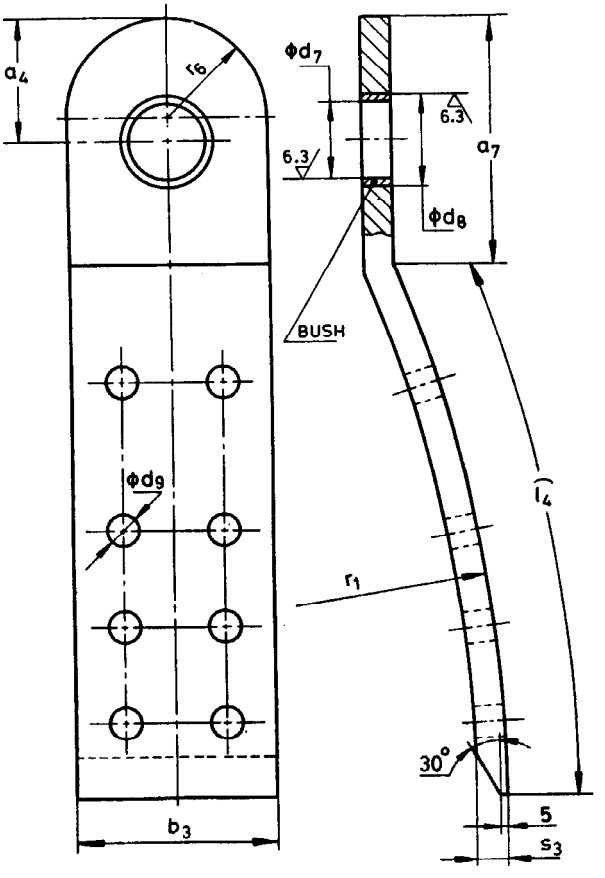
TABLE 10 DIMENSIONS FOR INTERNAL CLAMP PLATE WITH BUILT IN BUSHES

(*Clauses* 5.2, 7.4 and *Table* 1)

All dimensions in millimetres.



For buckets of 0·50 m³ to 1·00 m³ (500 to 1 000 litres) capacity



For buckets of 1·25 m³ to 4·00 m³ (1 250 to 4 000 litres) capacity

Nominal Capacity of Bucket		Width b_3 Min	a_4	a_7	d_7 +0·5 0	d_8*	d_9	l_4	r_1	r_6	s_3 Min	Snap Head Rivets According to IS : 1928-1961† (Sl No. 17 and 18 of Table 1)	
m^3	l												
0·50	500	125	75	150	40	50	21	285	800	62·5	16	20×58	20×75
0·75	750			145									20×78
1·00	1 000			150								20×60	20×80
1·25	1 250	130	80	160	50	60		360		65		20×68	20×90
1·50	1 500												
1·50	1 500	150	90	185	60	70			900	75	20	24×70	24×90
1·75	1 750												
2·00	2 000			175			25	380					24×95
2·25	2 250												
2·50	2 500												
3·00	3 000	160	95	185	70	80				80	25	24×85	24×105
3·50	3 500												
4·00	4 000												

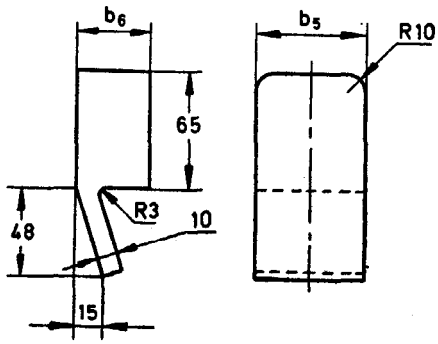
*d_8 *Max* = d_8 + 10 mm—ID of hole in clamp plate and OD of bush to match with interference fit.

†Specification for boiler rivets (12 to 48 mm diameter).

TABLE 11 DIMENSIONS FOR STOP PIECE

(*Clause* 5.2 and *Table* 1)

All dimensions in millimetres.



Nominal Capacity of Bucket		b_5	b_6
m^3	l		
0·50 to 1·50	500 to 1 500	50	30
1·75 to 4·00	1 750 to 4 000	60	40

9. Designation — A complete bucket of 1·00 m^3 (1 000 litres) capacity with base of Shape A, conforming to this standard shall be designated as:

Bucket A 1 000 IS : 12526

10. Marking — Each bucket shall be marked on suspension bar and the bolts with the manufacturer's name and/or his recognized identification mark and serial number.

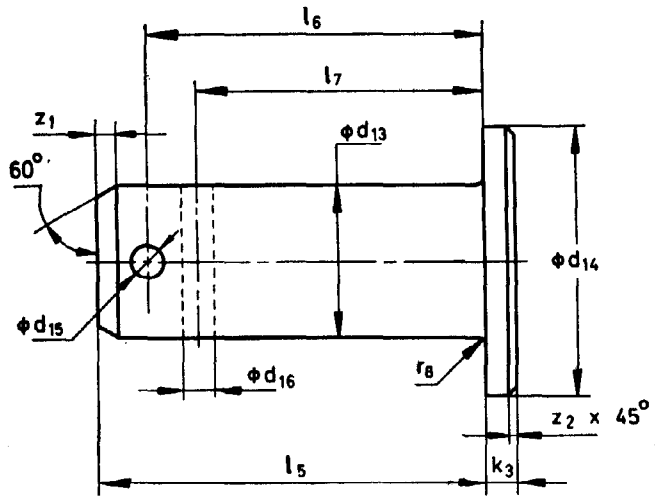
10.1 *Standard Marking* — Details available with the Bureau of Indian Standards.

10.1.1 Standard mark, when permitted under a valid licence, shall be either stamped or embossed below the external clamp plate on the bucket.

TABLE 12 DIMENSIONS FOR BOLTS

(*Clause* 5.2 and *Table* 1)

All dimensions in millimetres.



Nominal Capacity of Bucket		Bolt Diameter d_{12} h_{11}	d_{14}	d_{15}	d_{16}	k_3	l_5	l_6 +0·5	l_7 +0·5	r_8	z_1	z_2	Spring Dowel Sleeves According to IS : 5988-1970*	Split Pin According to IS : 549 1974†
m^3	l													
0·50	500	39·5	70	8	8	8	95	84	69	1·5	5	2	8×65	8×56
0·75	750						100	89	74					
1·00	1 000													
1·25	1 250	49·5	80	10	10	9	115	103	87	2	6		10×80	10×71
1·50	1 500													
1·50	1 500													
1·75	1 750	59·5	90			11	118	105	88	2·5		3	10×90	10×80
2·00	2 000													
2·25	2 250						123	110	93					
2·50	2 500													
3·00	3 000	69·5	100			12	138	125	108	3			10×100	10×90
3·50	3 500													
4·00	4 000													

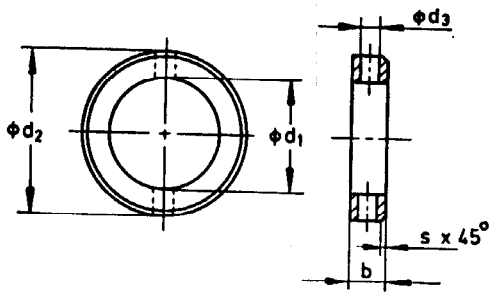
*Specification for spring dowel sleeves (light and heavy patterns) use in foundries.

†Specification for split pins (*second revision*).

TABLE 13 DIMENSIONS FOR FITTING RING

(*Clause* 5.2 and *Table* 1)

All dimensions in millimetres.



Nominal Capacity of Buckets		d_1 H_8	b J_{14}	d_3 h_{13}	d_5 H_{11}	s
m^3	l					
0·50 to 1·00	500 to 1 000	40	18	63	8	1·6
1·25 to 1·50	1 250 to 1 500	50	18	80	10	1·6
1·75 to 2·50	1 750 to 2 500	60	20	90	10	1·6
3·00	3 000	70	20	100	10	1·6

EXPLANATORY NOTE

In the preparation of this standard, considerable assistance has been derived from the following:

DIN 21181 Shaft sinking : D clorric kibbles. Deutsches Institut für Normung.

GOST 8569-1969 Sinking shaft buckets. USSR State Committee for Standards;

JUS M.J 9.250-1968 Mine hoisting buckets for hoisting of waste and men. Yugoslavian Standards Body.

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